

WHAT IS CLAIMED IS:

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1. A map display device for converting externally provided communications information into an applicable object model for arrangement on a map image, said device comprising:

5 an input part for receiving a user's instruction;  
a map data storage part for previously storing map data;  
an object model display information storage part for storing object model display information for displaying said object model on said map image;

10 a communications part for receiving said communications information;

a map data arranging part for creating said object model by interpreting said communications information and the object model display information provided by said object model display information storage part, and arranging the object model on said map; and

15

a display part for displaying a resultant map image obtained by said map data arranging part.

2. The map display device according to claim 1, wherein said communications information includes time-varying information.

3. The map display device according to claim 2, wherein

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said time-varying information is plurally provided.

4. The map display device according to claim 1, wherein said communications information includes traffic information.

5. The map display device according to claim 1, wherein said communications information includes advertisement information.

6. The map display device according to claim 1, wherein said communications information includes position information corresponding to a predetermined position on said map image.

7. The map display device according to claim 1, wherein said object model display information comprises:

information about shape of said object model; and

information about behavior in time and space of said

5 object model.

8. The map display device according to claim 7, wherein said information about behavior in time and space of said object model is described in an object-oriented interpreter language having no need for compilation.

9. The map display device according to claim 7, wherein

said information about behavior in time and space of said object model includes an execution condition and an execution function.

10. The map display device according to claim 1, wherein said map data arranging part appropriately arranges said object model on a road image of said map image.

11. The map display device according to claim 10, wherein said object model is plurally created and each appropriately arranged on said road image.

12. The map display device according to claim 1, wherein said map data arranging part comprises:

an object model display information execution part for interpreting and executing said communications information and  
5 said object model display information provided by said object model display information storage part;

an object model creation part for creating said object model responsively to a result obtained by said object model display information execution part; and

10 a data arranging part for arranging said object model on said map image.

13. The map display device according to claim 12, wherein

said map data arranging part further comprises a 3D map generation part for generating a 3D map image based on 2D map data  
5 provided by said map data storage part, and

said data arranging part arranges said object model on the map image generated by said 3D map creation part.

14. The map display device according to claim 12,  
wherein

5 said map data arranging part further comprises a 2D/3D coordinate transformation part for transforming a 2D object model created by said object model creation part into a 3D object model, and

said data arranging part arranges the 3D object model transformed by said 2D/3D coordinate transformation part on said map image.

15. The map display device according to claim 1, further comprising a time information storage part for storing time information corresponding to a position of a mobile unit which moves according to schedule on a predetermined route,  
5 wherein

said map data arranging part refers to said time information to create said object model corresponding to said mobile unit for arrangement on said map image.

16. The map display device according to claim 15,  
wherein said map data arranging part refers to said time  
information to select only the object model corresponding to said  
mobile unit to be displayed on said map image, and calculates a  
5 position of the object model on said map image for data  
arrangement.

17. The map display device according to claim 1,  
wherein

said communications part receives the communication  
information including information for specifying a faregate to  
5 be passed through, and if necessary, transmits charge information  
for a charge processing, and

said map data arranging part creates, if necessary,  
said object model corresponding to said communications  
information for arrangement on said map image, and generates said  
10 charge information.

18. The map display device according to claim 17,  
wherein said map data arranging part generates said charge  
information by referring to said communications information  
related to said faregate placed at an entrance and an exit for  
5 a predetermined chargeable section, and creates an object model  
including a fare for said chargeable section for arrangement on  
said map image.

19. The map display device according to claim 17, further comprising a ticket information storage part for storing ticket information corresponding to a ticket used for paying the fare for said chargeable section, wherein

5        said map data arranging part generates said ticket information stored in said ticket information storage part when said ticket is purchased, and if necessary, changes said communications information.

20. The map display device according to claim 19, wherein

      said ticket information includes information about an expiration date of said ticket, and

5        said map data arranging part refers to the information about the expiration date of said ticket, and if necessary, creates a message for display on said display part.

21. The map display device according to claim 1, wherein

      said communications part receives the communications information including position information about any available  
5 vehicle, and when the user desires to take one of the available vehicles, transmits selected vehicle information including information for specifying which vehicle the user desires to take, and

10        said map data arranging part creates said object model  
corresponding to said communications information for arrangement  
on said map image, and when the user desires to take one of the  
available vehicles, generates said selected vehicle information.

22.    The map display device according to claim 21,  
wherein said available vehicles are located within a  
predetermined area range close to a current position of the user.

23.    The map display device according to claim 21,  
wherein said available vehicles move according to schedule on a  
predetermined route.

24.    The map display device according to claim 21,  
wherein said communications part transmits a request for vehicle  
information including the current position of the user for an  
externally provided information center, and receives the  
5    communications information including the position information of  
the available vehicles selected by said information center.

25.    The map display device according to claim 21,  
wherein said map data arranging part refers to said communications  
information, creates said object model each corresponding to said  
available vehicle, and if necessary, creates an object model  
5    including information about said available vehicles for

arrangement on said map image.

26. A navigation device for converting externally provided communications information into an applicable object model for arrangement on a map image, and making a guidance to a destination, said device comprising:

5 an input part for receiving a user's instruction;  
a position detection part for detecting a current position;

a map data storage part for previously storing map data;  
an object model display information storage part for  
10 storing object model display information in advance for displaying said object model on said map image;

a route selection part for selecting a route to the destination based on said instruction provided by said input part, said current position detected by said position detection part,  
15 and said map data stored in said map data storage part;

a communications part for receiving said communications information;

a map data arranging part for creating said object model by interpreting said communications information and the object  
20 model display information provided by said object model display information storage part, and arranging the object model on said map;

a guiding part for making the guidance to the



destination in response to said communications information  
25 received by said communications part, said route selected by said  
route selection part, said current position detected by said  
position detection part, and said map data provided by said map  
data storage part, and outputs a resultant map image obtained by  
said map data arranging part; and

30 a display part for displaying said resultant map image  
outputted from said guiding part.

27. The navigation device according to claim 26,  
wherein said object model display information comprises:

information about shape of said object model; and

5 information about behavior in time and space of said  
object model.

28. The navigation device according to claim 27,  
wherein said information about behavior in time and space of said  
object model is described in an object-oriented interpreter  
language having no need for compilation.

29. The navigation device according to claim 27,  
wherein said information about behavior in time and space of said  
object model includes an execution condition and an execution  
function.

30. The navigation device according to claim 26,  
wherein said map data arranging part appropriately arranges said  
object model on a road image of said map image.

31. The navigation device according to claim 10,  
wherein said object model is plurally created and each  
appropriately arranged on said road image.

32. The navigation device according to claim 26,  
wherein said map data arranging part comprises:

an object model display information execution part for  
interpreting and executing said communications information and  
5 said object model display information inputted from said object  
model display information storage part;

an object model creation part for creating said object  
model responsively to a result obtained by said object model  
display information execution part; and

10 data arranging part for arranging said object model on  
said map image.

33. The navigation device according to claim 32,  
wherein

said map data arranging part further comprises a 3D map  
creation part for generating a 3D map image based on 2D map data  
5 provided by said map data storage part, and

said data arranging part arranges said object model on the map image generated by said 3D map creation part.

34. The navigation device according to claim 32, wherein

said map data arranging part further comprises a 2D/3D coordinate transformation part for transforming a 2D object model created by said object model creation part into a 3D object model, and

said data arranging part arranges the 3d object model transformed by said 2D/3D coordinate transformation part on said map image.

35. The navigation device according to claim 26, further comprising a time information storage part for storing time information corresponding to a position of a mobile unit which moves according to schedule on a predetermined route, wherein

said map data arranging part refers to said time information to create said object model corresponding to said mobile unit for arrangement on said map image.

36. The navigation device according to claim 35, wherein said map data arranging part refers to said time information to select only the object model corresponding to said

mobile unit to be displayed on said map image, and calculates a  
5 position of the object model on said map image for data  
arrangement.

37. The navigation device according to claim 26,  
wherein

5 said communications part receives the communication  
information including information for specifying a faregate to  
be passed through, and if necessary, transmits charge information  
for a charge processing, and

10 said map data arranging part creates, if necessary,  
said object model corresponding to said communications  
information for arrangement on said map image, and generates said  
charge information.

38. The navigation device according to claim 37,  
wherein

5 said guiding part generates said charge information by  
referring to said communications information related to said  
faregate placed at an entrance and an exit for a predetermined  
chargeable section, and

said map data arranging part creates an object model  
including a fare for said chargeable section for arrangement on  
said map image.

39. The navigation device according to claim 37, further comprising a ticket information storage part for storing ticket information corresponding to a ticket used for paying the fare for said chargeable section, wherein

5           said guiding part generates said ticket information stored in said ticket information storage part when said ticket is purchased, and if necessary, changes said communications information.

40. The navigation device according to claim 39, wherein

          said ticket information includes information about an expiration date of said ticket, and

5           said map data arranging part refers to the information about the expiration date of said ticket, and if necessary, creates a message for display on said display part.

41. The navigation device according to claim 26, wherein

          said communications part receives the communications information including position information about any available  
5   vehicle, and when the user desires to take one of the available vehicles, transmits selected vehicle information including information for specifying which vehicle the user desires to take,

          said map data arranging part creates said object model

corresponding to said communications information for arrangement  
10 on said map image, and

said guiding part generates said selected vehicle  
information when the user desires to take one of the available  
vehicles.

42. The navigation device according to claim 26,  
wherein

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FIG. 13  
5 said communications part receives the communications  
information including position information about any available  
vehicle moving on a predetermined route, and when the user desires  
to take one of the available vehicles, transmits selected vehicle  
information including information for specifying which vehicle  
the user desires to take,

10 said map data arranging part creates said object model  
corresponding to said communications information for arrangement  
on said map image, and

said guiding part generates said selected vehicle  
information when the user desires to take one of the available  
vehicles.

43. The navigation device according to claim 42,  
wherein said available vehicles are located within a  
predetermined area range close to a current position of the user.

44. The navigation device according to claim 44, wherein said available vehicles move according to schedule on the predetermined route.

45. The navigation device according to claim 44, wherein said guiding part compares, at least, said predetermined route on which said available vehicles move with the route to the destination selected by said route selection part, and determines  
5 whether the available vehicles are appropriate.

46. The navigation device according to claim 42, wherein said communications part transmits a request for vehicle information including the current position for an externally provided information center, and receives the communications  
5 information including the position information of the available vehicles selected by said information center.

47. The navigation device according to claim 42, wherein said map data arranging part refers to said communications information, creates said object model corresponding to said available vehicle, and if necessary, creates an object model each  
5 including information about said available vehicles for arrangement on said map image.

48. A map display method for converting externally

provided communications information into an applicable object model for arrangement on a map image, said method comprising:

an input step of receiving a user's instruction;

5 a communications step of receiving said communications information;

a map data arranging step of creating said object model by interpreting said communications information and corresponding object model display information for displaying said object model on said map image; and

10 a display step of displaying a resultant map image obtained in said map data arranging step.

49. The map display method according to claim 48, wherein said map data arranging step comprises:

an object model display information execution step of interpreting and executing said communications information and  
5 said object model display information;

an object model creating step of creating said object model responsively to a result obtained in said object model display information execution step; and

10 a data arranging step of arranging said object model on said map image.

50. The map display method according to claim 49, wherein





in said communications step, the communication information including information for specifying a faregate to  
5 be passed through is received, and if necessary, charge information for a charge processing is transmitted, and

in said map data arranging step, if necessary, said object model corresponding to said communications information is created for arrangement on said map image, and said charge  
10 information is generated.

54. The map display method according to claim 48, wherein

in said communications step, the communications information including position information about any available  
5 vehicle is received, and when the user desires to take one of the available vehicles, selected vehicle information including information for specifying which vehicle the user desires to take is transmitted, and

in said map data arranging step, said object model  
10 corresponding to said communications information is created for arrangement on said map image, and when the user desires to take one of the available vehicles, said selected vehicle information is generated.

55. A navigation method for converting externally provided communications information into an applicable object

model for arrangement on a map image, said method comprising:

an input step of receiving a user's instruction;

5 a communications step of receiving said communications information;

a position detection step of detecting a current position;

10 a map data arranging step of creating said object model by interpreting said communications information and the object model display information provided by said object model display information storage part, and arranging the object model on said map;

15 a route selection step of selecting a route to the destination based on said instruction inputted in said input step, said current position detected in said position detection step, and said map data;

20 a guiding step of making the guidance to the destination in response to said communications information received in said communications step, said route selected in said route selection step, said current position detected in said position detection step, and said map data, and outputting a resultant map image obtained in said map data arranging step; and

25 a display step of displaying said resultant map image outputted in said guiding step.

56. A computer-readable recording medium having a

program recorded thereon to be executed in a map display device for converting externally provided communications information into an applicable object model for arrangement on a map image,

5 said program comprising:

an object model display information execution step of interpreting and executing said communications information and object model display information for displaying said object model on said map image;

10 an object model creating step of creating said object model responsively to a result obtained in said object model display information execution step; and

a data arranging step of arranging said object model on said map image.

57. A computer-readable recording medium having a program recorded thereon to be executed in a navigation device for converting externally provided communications information into an applicable object model for arrangement on a map image,

5 said program comprising:

an object model display information execution step of interpreting and executing said communications information and object model display information for displaying said object model on said map image;

10 a route selection step of selecting a route to a destination based on the instruction inputted from the user, a

current position, and map data; and

a guiding step of making the guidance to the destination  
in response to said communications information, said route  
15 selected in said route selection step, said current position, and  
said map data, and outputting a resultant map image obtained in  
said map data arranging step.

58. A computer program to be executed in a map display  
device for converting externally provided communications  
information into an applicable object model for arrangement on  
a map image, said program comprising:

5 an object model display information execution step of  
interpreting and executing said communications information and  
object model display information for displaying said object model  
on said map image;

10 an object model creating step of creating said object  
model responsively to a result obtained in said object model  
display information execution step; and

a data arranging step of arranging said object model  
on said map image.

59. A computer program to be executed in a navigation  
device for converting externally provided communications  
information into an applicable object model for arrangement on  
a map image, said program comprising:

an object model display information execution step of interpreting and executing said communications information and object model display information for displaying said object model on said map image;

5 a route selection step of selecting a route to a destination based on an instruction inputted from a user, a current position, and map data; and

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a guiding step of making the guidance to the destination in response to said communications information, said route  
10 selected in said route selection step, said current position, and said map data, and outputting a resultant map image obtained in said map data arranging step.

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